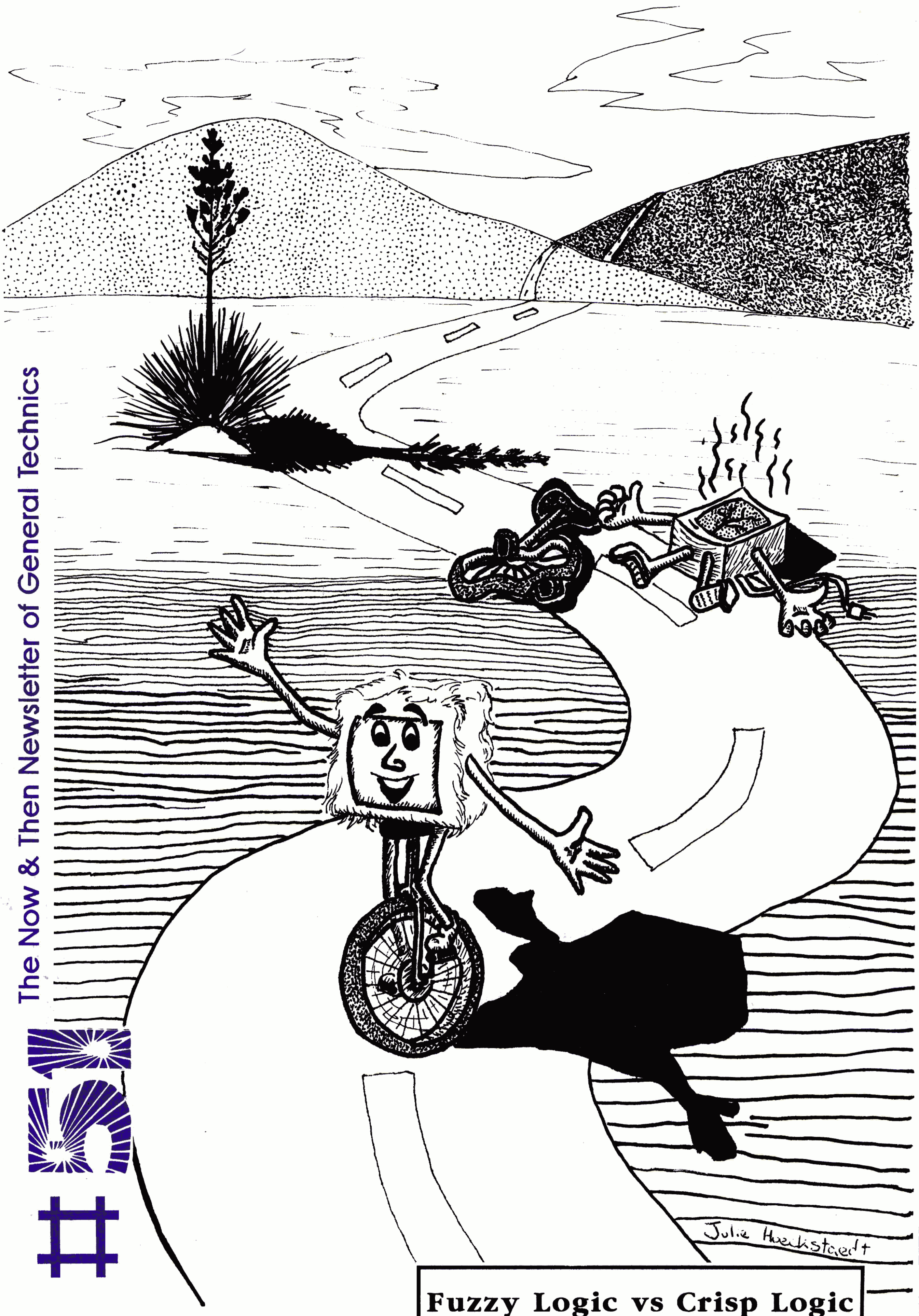
PYROTECHNICS #51

The Now & Then Newsletter of General Technics



Fuzzy Logic vs Crisp Logic

Quarks

• New subscriber Ranjit Bhatnagar recommends some artists-and-techies organizations you might like to know about. One is a group called "Ylem" which has monthly meetings and publishes a newsletter:

Ylem: Artists Using Science and Technology
P.O. Box 749
Orinda, CA 94563

Another group runs an annual "Small Computers in the Arts" conference in November, for which Ranjit was the organizer in 1990.

Small Computers in the Arts
5132 Hazel Ave.
Philaelpia PA 19143

• We apologize for the tail end of the "Quarks" column in Issue 49, which was a jumble of notes on more items we wanted to write about, and wasn't supposed to get printed. What we *really* wanted to do was announce the birth of Nicholas Roland Santore on 9 December 1991. His parents, Valerie and Nick, are now busy attempting hypnotic methods to convince young Nicholas to love science fiction. Tip: Try reruns of *Supercar*—it worked on us.

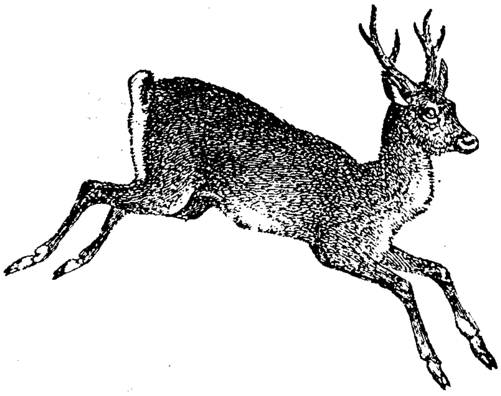
• Other new techies have appeared in Chicagoland since, in the distant past, we last kicked out an issue. Clayton Insley joined Judi, Alan, and brother Matthew in Rogers Park. Gregory Meida was born to Roxanne in September. Martin Alexander Bentley (yet another Insley cousin!) moved into the fannish complex on Pratt Avenue, with Alice and Mike, shortly after birth on 3 January 1993. We offer best wishes to our new friends.

• Wedding Bells and Blinkies Department:
We've also seen a perfectly overwhelming number of weddings take place among our GT friends in 1992. Congratulations to the happy couples who began their marriages in the following towns:
Reneé Sieber and Henry Balen in Detroit
Donna Struwe and Tim Stevens in Kalamazoo
Maria de Jony and Marty Franz in Kalamazoo
Julie Skirvin and Ted Hueckstaedt in Chicagoland
Judith Martin and C.W. Robertson in Wichita
Rebecca Hayne and Jim Fuerstenberg in Chicago

Julie and Ted, who help produce this newsletter, were married 11 October at "Medieval Times" in Schaumburg with most of the *Pyro Technics* gang looking on. MT is sort of a commercial creative anachronism. The wedding party dressed in elegant Renaissance style. During the reception, guests gnawed on a medieval feast without utensils. While serving-wenches filled our mugs we enjoyed a spectacular tournament featuring knights in combat, trained horses, and wizards. Swords clashed, sparks flew, lances shattered, that sort of thing. Impressive.

• We are sorry to report that Joe the Iguana passed away on 14 July. You may recall meeting him at the Chicago Worldcon perched on Mike Bakula's shoulder. We will miss Joe. There never was anybody greener.

• Our staffer Mary Lynn Johnson received a major dose of egoboo, along with more tangible rewards, at the Conclave art auction. Her picture "Sao's Challenge" was voted Best Professional Fantasy Painting. It portrays Sao, a snow-leopard-centaur warrior, in combat with a nasty-looking dragon. A bidding war erupted among Detroit-area fans for the painting; John Lussmeyer took it home with an $800 bid, making Mary Lynn very happy (and incidentally doubling her personal record price for auctioned paintings).



• Tough Way To Turn A Buck Department: Another *Pyro* artist is not faring so well. Cruising lonely Parnell Avenue one dark night, Paul MacNerland's Volkswagen Fox collided with a deer, knocking the Fahrvegnugen out of him. Paul and his co-pilot, Dawn Kuczwara, were unhurt, but the Fox sustained major damage. Did Paul at least scavenge the venison? Nope. The buck wound up feeding the family of the county police officer who arrived on the scene. We hear Paul will be painting a deer silhouette on the side of his car, much like the one that adorns Jim Fuerstenberg's Porsche.

• We heard a rumor that, during the last lunar eclipse, Todd Johnson was observed sticking his hand up into the sunset to try to make giant shadow puppets on the Moon.

T-Shirts and Bumper Stickers

Mary Lynn S. Johnson

I hope to be able to have ready by next year two designs of t-shirts and one or two bumper stickers to offer to GT folks. The profits from these t-shirts will go towards helping cover some of *Pyro*'s outside expenses like the P.O. Box.

One thing, though. I'd like to have some input as to what kinds of designs and slogans everyone would like to see done. Some of my ideas are as follows:

• A black t-shirt with the big GT symbol on it followed by the words "General Technics" printed in white. Unlike previous shirts, the design would go all the way across the chest.

(COUNTING METHOD USED BY MEMBERS OF THE ZULU TRIBE)

- A GT/PFRC Berserker t-shirt that would commemorate the events that occurred each year. (Yes, we could do retrograde shirts for previous berserkers.) *(Higgins pipes up: "But you have to wear them backwards.")* The 1989 shirt would have the dirigible with Guy hanging under it along with some catchy phrase. The 1991 shirt would have the big styrofoam rocket taking off with perhaps some lobsters or something as well as a catch phrase. The 1993 shirt will depend on what's on the agenda for that year. Paul MacNerland has already agreed to do some art for all of these.

(Note: The shirts would probably be printed on black or dark blue shirts and I will insist on the Hanes "Beefy-T" to ensure lasting quality.)

For bumper stickers I'd like to do something along the lines of "General Technics Field Unit" or something similar. I'm very open to ideas for things we could do on bumper stickers so if you think of some, even if they don't coincide with what I've been pondering, send them along.

I have to decide what I'm doing with these projects by early this year so I can have them ready by the time the Berserker rolls around. Any comments or ideas any of you may have would be greatly appreciated!

Letters to the Editors

Dear *Pyro:*

Just wanted to let you know how much I enjoyed Issue 50. Sam Paris's magnet story was great, and I really liked Bob Wittig's undercover exposé of Disney World's inner workings. Keep 'em coming!

Clairvoyantly yours,

Edgar Cayce

Dear *Pyro:*

Those in the shadow of the ring join a game,
When the pyres lost half a century
Issue from a box in the city of the boreal glows,
Ill noise shall announce the mischief of the artificers.

Michel de Notredame

Dear *Pyro:*

In *PyroTechnics* 49 I read Part 1 of the very interesting article, "The Forerunner Aircraft," by Mr. Rod Smith. Naturally I was disappointed to find that #50 did not contain Part 2. What went wrong?

Sincerely,

Jeane Dixon

Unforseen circumstances prevented Part 2's appearance in #50. You'll find it in this issue instead. We predict you'll like it even more than Part 1. —The Editors

Isaac Asimov

1920-1992

an appreciation by Barry Gehm

When I was a freshman in high school, I discovered a book in the library called *The Noble Gases.* At that time I knew just enough chemistry to know that this was another name for the "inert" gases, which are distinguished by their extreme unreactivity. "How," I asked myself, "could anyone possibly write an entire book on the chemistry of elements whose principal characteristic is not having any chemistry? How interesting could it be?"

Well, I was young and ignorant. When I finished reading the book, which was fascinating, I was a little less ignorant, especially about the noble gases. By the time I finished reading *Building Blocks of the Universe, Life and Energy, The Roman Republic,* and *Only a Trillion,* I was still less ignorant. And I was beginning to wonder who this guy was.

The card catalog showed he also wrote science fiction. I started on that.

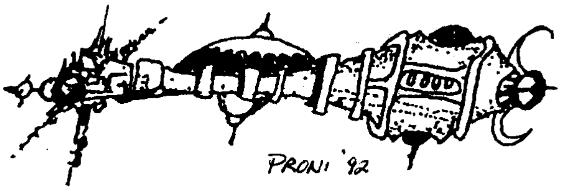
Do you remember the first time you read "Nightfall"? Do you remember the way the death of an entire civilization was brought home with a vividness that left you (if you were like me) shaken and near tears, by a story that mostly consisted of a few characters sitting around talking? Who *was* this guy?

Well, according to the book jackets, he was an associate professor of biochemistry at Boston University. That biochemistry must be pretty interesting stuff, I thought, if he learned all this stuff while he was studying it. Maybe I should study it too...

Unfortunately, most high schools don't offer courses in biochemistry. But I continued to read his books, and learned as much or more from them as I did from my classes. Isaac Asimov became my favorite teacher.

When the time came in college, I did study biochemistry. Somehow my classes didn't mention xenon trifluoride or the Roman Senate or quasars or galactic empires, but they were still pretty interesting. And anyway, I had already learned that other stuff in Dr. Asimov's class. A lot of us in GT were in that class. It was a big class, but the teacher always had time to explain things clearly, time to tell a few funny stories and a few serious ones, time to mention just one more interesting item. But now the time is up. The bell has rung, the class is over. Our favorite teacher is gone.

There are people who help shape our lives life from a distance, people whose words or music or art or example help us discover who we are. If we are very lucky, we may get a chance to thank them. Years ago, I was fortunate enough to be able to tell Isaac Asimov how his books had influenced me. He seemed pleased then; I like to think he'd be more pleased now. I just finished writing a paper to be sent to the *Journal of Biological Chemistry*. Scientific papers generally don't carry dedications, but in my heart, Dr. A., this one's for you.



Editorial

Bill Higgins

Why You're Reading the Time Travel Issue

Bet you're wondering where *PyroTechnics 50* went. We're still at work on it. We want our Golden Issue to be, well, golden, and we're still preparing lots of tales of techie folklore, astounding exploits, amazing inventions, and appalling pranks for this special issue. It's not too late to submit your favorite techietales!

But we really had plenty of good material already on hand, so we decided to publish Issue 51. Think of it as a gift from the future.

Why It's Been a Loooooong Time between Issues

We, the Chicago-area gang who produce *PyroTechnics*, took over several years ago with the best of intentions and a firm ambition to get this newsletter out on a regular basis. We've had ups and downs, but have managed—with plenty of help from the writings and drawings of wonderfully creative GT members around the planet—to publish ten issues in a period of three years.

In 1992 we fell down on the job. To get *Pyro* going, we need to feel an "itch," a sense of urgency, about two months after we get an issue out. This motivates us to bug each other about writing stuff for the next issue and about holding meetings to work on material that's come in the mail. Somehow, in the spring of 1992, we didn't work up sufficient itch... then Events Began To Overtake Us.

To make a long story short, in the past few months, our editorial staff has been through seven changes in residence and three changes in jobs. No sooner does one person unpack boxes than another snatches the empties away for another move. We're still close to Chicago, and still in regular contact, but this has really played hell with our production. We're sorry. We hope to do much better in the very near future!

Anything Goes

by Fred Robinson

Now You See Me, Now You... Do?
Practical Implications of Invisibility

Just saw *Memoirs of an Invisible Man* (from the book of the similar name) starring Chevy Chase. Not bad, overall. A fairly amusing action-comedy tale. I gather that a lot of the deeper parts of the book were left out. There were a few consistency flaws, but then, what movie doesn't have them?

So I'm talking about invisibility. Being transparent, unseen, but physically there. How might this be accomplished, and what are the problems?

Spirits, devils, angels, ghosts, etc. can become invisible at will. I'll ignore them since they are supernatural and we have no hard data on them. (As if there's hard data on what comes next!)

Invisibility is, basically, not being seen. Unlike the Monty Python sketch, where people who are not being seen are merely hiding behind bushes, the invisible object either allows light to go through or around it, or else fails to make an impression on the observer. Nothing we know of except colorless gasses like air are invisible. Some things are close, though. A perfect white diamond will supposedly disappear when dropped in a glass of water. Some fish are nearly transparent. But nothing is as clear as air.

But suppose it could be done. What is the general effect? We have three possibilities: 1) Light goes through, 2) Light goes around, and 3) The object is ignored. Let's look at some examples.

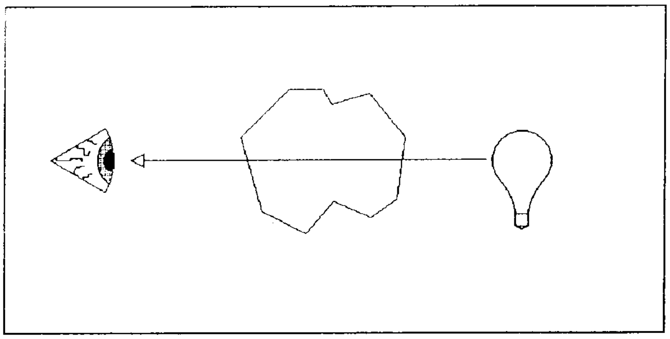


Figure 1 Transmissive Invisibility

1) Light goes through: Transmissive invisibility or TI (Figure 1). This is the most popular. Griffin, H.G. Wells' *Invisible Man*, was an albino who discovered how to reduce the index of refraction of unpigmented objects to that of air. He did this with a combination of drugs and esoteric etheric vibrations.

The TV series *The Invisible Man*, starring David McCallum as Westin, also used machinery to do it. Normally the effect was temporary, but oddly enough could be counteracted in living things with an injection of something. Westin wound up permanently invisible by using the machinery on himself once too often.

Nick (the hero of *Memoirs...*), was caught in an accident involving an experimental research company whose goal had nothing to do with invisibility. About half of the building he was in went invisible as well, here and there. Some time later, it went completely invisible.

In TI, the atoms of the invisible object do not react to light at all. How far does this go, however? Is the object invisible at all wavelengths, or only those surrounding our "visible light" region? Depending on the answer, you could use other wavelengths to see the invisible thingie.

I have this ludicrous image of electrons hustling to get out of the way of incoming photons...

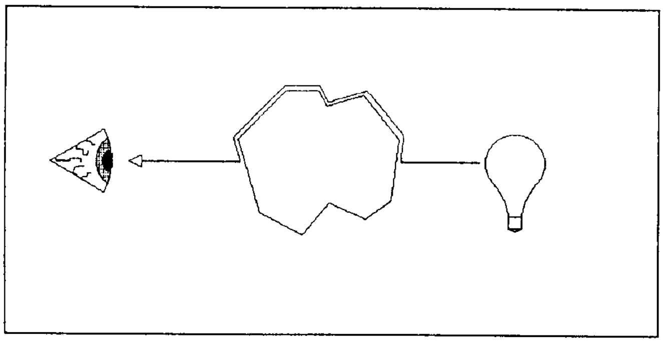


Figure 2 Refractive Invisibility

2) Light goes around: Refractive invisibility or RI (Figure 2). This is not used as often. The general assumption is that it can be turned on and off as needed. There was a bad TV movie some years ago about a Captain Chameleon. Part of his shtick was a cape that bent light around him with a little distortion. More recently, or at least more popularly, is the invisibility of the Predators of the movies. Their invisible suits are somewhat grainier than the Captain's, but the predators used the invisibility to better effect. The Romulan cloaking device from *Star Trek* yet another example.

At least one SF story has used this method (I forget the title). A tank sent to destroy a invading alien ship is covered with fiber optic channels to make it largely invisible. The gimmick worked, but the mission failed for other reasons.

Dexter Riley (played by Kurt Russell) cooked up a spray that made whatever it covered invisible in *Now You See Him, Now You Don't*. It washed off with water and so had its own special problems. I'm pretty sure that this is a case of RI, but it's been a while since I saw it last. Obviously, though, a topical spray can't get to the insides.

The AD&D spell *improved invisibility* is probably of the RI kind, based on the description.

3) Ignoring the object: Perceptive invisibility or PI (Figure 3). This is more psychological than physical invisibility. Douglas Adams, in *Life, the Universe, and Everything*, dreamed up the SEP generator, which causes anyone who sees something equipped with one to ignore it, since it's Someone Else's Problem. The effect is increased if the object in question is also drastically out of context, say, painted paisley.

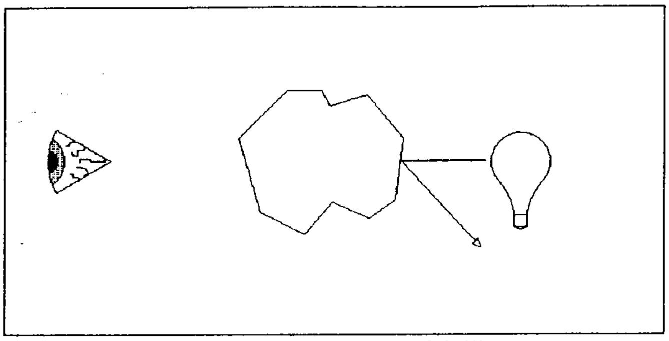


Figure 3 Perceptive Invisibility

Larry Niven's *A Gift from Earth* involved this effect, eventually dubbed Plateau Eyes. The hero didn't realize what he was doing for quite a while and was quite frustrated about his lack of success with women.

The AD&D spell *invisibility* seems to be PI. It works until you bring attention to yourself by attacking someone. The spell *invisibility 10' radius* affects a group the same way, as long as they stay within the circle. There is also *sanctuary*, which has a weaker PI effect and is good only in battle.

OK, so now you're invisible. Anyone can dream up useful things to do in this state, but what are the drawbacks? To be honest, the following list applies best to TI. When an item applies to either of the other kinds, I'll mention it.

The big one is dirt. As Griffin observed, cleanliness is next to invisibility. It also happens to be next to impossible. Even the lightest covering of smog or dew will outline you. Rain and fog will show you up big-time. Just walking down the street, your feet pick up all kinds of crud. Pretty soon people are watching footprints walk by all by themselves. ("I see footsteps." -- Ringo, in *The Yellow Submarine*, which has nothing to do with the topic but it's still a good line.)

Next is clothes. Griffin discovered this very soon, since he made himself invisible in January of a sloppy London winter. Unless you also make some invisible clothes, you're subject to the vagaries of weather. However, invisible clothes are also subject to the dirt problem, and on top of that are hard to find when you're not wearing them. Nick was lucky in that he got zapped while fully dressed, so his suit went along with him. With RI, however, you can wear your invisibility cloak (or whatever) over your everyday duds.

Vision is a problem for both TI and RI. If light is going through or around you, darn little is going to actually stop at your retina! On top of that, your lens and cornea are also invisible, so they can't focus the light. Bingo, you're blind. Granted, you could peek out of your RI field from time to time, but TI people would need a pair of ghostly eyes to get around. This is never addressed in the stories.

Now try picking up something. Everybody sees it hanging in the air all by itself. Most will try to grab it. This makes invisible theft about as difficult as non-invisible theft. With an RI field, you can stick your swag in an inside pocket. But if you're TI like Griffin, you have to sneak it out along the wall, or create a distraction to direct attention away.

Here's a disgusting thought, for TI only. You're invisible, but your lunch isn't. There's a stomach-shaped blob of digesting food floating around! This presents a related problem: Unless something happens to the atoms in the food, they will gradually replace your invisible atoms and you will become a shadow of your former self again. Not to mention the revolting sight of a meal traveling through your gut.

This effect would knock William Beaumont's work into a cocked hat*. Most doctors would give their eye teeth to watch what happens to a meal without having to resort to clumsy & uncomfortable fiber-optic viewing thingamajigs. They might even be able to watch as food transferred from the small intestine to the blood and traveled about.

Both Wells and the author of *Memoirs...* avoided this by having food become invisible as it is digested. There was no reason given for this effect, it just happens. A reasonable plot device, given that otherwise TI-type invisibility is completely useless.

I have no idea how long it would take to become visible with this process, or what parts would show up when. I imagine that haemoglobin would be first, followed by skin, nails, and hair. Teeth would probably never show up (except for plaque).

Smoking is another special TI problem. The smoke may be exhaled quickly enough, but even a few cigs would leave a filthy pair of lungs wandering around. This could be used in a hard-hitting anti-smoking campaign.

Memoirs... made a mistake when Nick's lungs were shown filling with smoke, as he was speaking. You try talking on the inhale, and you'll find it's darn near impossible.

Next, people have a tendency to take up space. If they see some empty space, they move into it and fill it. Now, if you are invisible and already taking up that space, your cover is blown. You have to be on the lookout constantly. Walking directly behind someone is fairly effective. With an RI field, you can turn it off and blend into a crowd (normally a dangerous place for an invisible person) and turn it on again when the crowd thins out. Assuming, of course, that the RI generator itself is not painfully obtrusive.

Finally, you have to be as quiet as or quieter than your surroundings, with both TI and RI. Sneeze when there's only one other person in the room and your cover is blown again.

None of the above are problems for PI. PI makes people's eyes slide right off you, so they look away, avoid you, and forget you are there. Noise, dirt, and reasonably small objects present no problem.

However, since PI affects other people, it can't fool remote cameras and recording devices. The only way to beat this is to be so nondescript that anyone viewing the recordings looks right past you. This is hard to do. PI could be combined with RI to improve the results.

Most of TI's problems go away if you can turn it on and off at will, like an RI field. Especially if you can extend the effect beyond your body to affect your lunch, clothes, dirty feet, and that wad of money you just picked up. At this point, it becomes the functional equivalent of RI.

I'm sure there are other problems I've missed. I've listed enough to get you going. If you can lick these, achieving invisibility itself should be a piece of cake.

Be seeing you.

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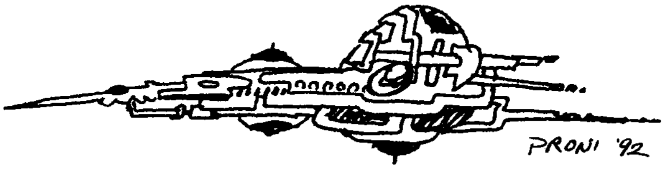
*Who's William Beaumont? He was a doctor on Mackinac Island during the fur-trapping days. One of his patients was a trapper who had been shot in the stomach (not the belly). The man survived and the wound healed, but sideways: The inner lining of the stomach joined with the skin of the chest, and he wound up with a hole leading to his stomach. Beaumont used this hole to extract fresh stomach juices and study the process of digestion *in situ*. This made Beaumont very famous and they named a hospital after him. His subject eventually got fed up and asked to be buried in an unmarked grave.



Cruising Cabs No Left Turn
Joachim Schürmann

The title of an essay should not necessarily describe its content. I agree there with Umberto Eco[1]. The title is a bookmark, a reminder of the content rather than its description. This title I gleaned from a sign posted on a Detroit street[2]. The sign has haunted me for the past few weeks. It is irrelevant, and yet somebody spent taxes on it. My concern with this sign does not make my point, nevertheless, it is somehow pertinent.

First the good news: Sarajevo is being shelled and the starving population of the Bosnian capital is a pawn on the checkerboard of international politics. Bands of Mujaheddin ravage Kabul. Iraq persecutes its Curds. Israelis and Palestinians kill each other. The Italian chief prosecutor of Mafia crimes gets blown sky high in Palermo[3]. Haiti is hurting and the US is confused. Crime in Germany is surging and the economic strength is in decline. Employment in Switzerland is flat. Police flees the riots in LA. Poverty in the US has increased almost 25% between 1970 and now[4]. Only 19% of people living in the US "think the country is going into the right direction".[5]

Now the bad news: it is not getting better anytime soon.

There is one particular aspect of today's world affairs that I would like to address: the instant technological panacea. The immediate gratification that can be derived from a focused, quick and simple solution. This is a significant issue in today's world affairs. "Mummy, mummy I want the new

Nintendo" or " Congress, I need the new F-16" are just two different aspects of the same problem.

I note that under the guise of a "Solution" to a problem, often a self enclosed "System" is provided, a quick fix to a perceived nuisance. This may cure the symptom but will it address the cause? Dwindling funds and increased demands on our attention seem to shorten our temper, causing the implementation of more stop gap measures and perpetuating the spiral.

This is no idle talk: examples abound. They are not all technical, but as technologies and techniques often provide ready made tools, many of them are. "The single worst thing the government can do to harm American productivity and competitiveness is to increase protection."[6] There seems to be consensus: protectionism will price any economy right out of the global market. And yet, there is mounting pressure to use protectionism as a tool, just to get a few years of relief. The recent riots in LA: throw money at the problem, repair the buildings, create tax free zones and the problem will go away. Will it? Airports are congested: let's build new ones. Nuclear power is bad: stop the plants. Main street is crumbling. Shall we close it to traffic so people will stop complaining? The underlying issue is ethical and cultural. And this issue is best addressed through the way we are getting things done: management style, and the ways we communicate and address problems.

Frederick C. Crawford, the now centenary retired top manager and president of TRW, says: "Common sense and decency are the keys to management. [...] there aren't a lot of rules to management." [7]. And yet, is there any common sense in peddling management techniques and rules to the inept? Techniques cannot replace common sense. How many recipes for success have we seen? The one minute manager. Management by Objectives. Management by Numbers. Empowerment.

Techniques go in and out of fashion. However: the goal is always the same. Do the right thing at the right time with the right people. No technique is totally right, no technique is totally wrong. And no technique will work unless applied in the right context. Let's spend a moment to explore the current fad: Empowerment.

Empowerment is the most recent buzzword. We empower the card holder to access the balance of his or her account through the telephone. We empower the salesperson to directly update the company's sales statistics. We empower the computer user to make choices. In the negative sense, "empowerment" means to download some decision or activity on somebody down the hierarchy, on the bottom of the corporate "food chain", preferably onto the customer. In a more positive sense "empowerment" can imply the abolition of the hierarchy, as we know it. Empowerment means that decision making and execution are not two distinct functions. The complexity of interrelationship is such that all problems are universal in nature and all solutions will influence each other. Indeed the definition between problem and solution itself is blurred. A single brain or an ivory tower committee cannot safely address the potential of induced and perceived changes. This is where the executor and the decision maker meet. And again the definitions blur.

There are many abuses of this concept. When technology is established as a barrier to rampant disservice or to disguise management inefficiencies. Yelling at the machine will not solve the problem. It will just make people mad and create a preconceived notion that the machine is evil: people are empowered, but the tool is broke. Under the guise of empowerment new problems are implemented: does the electronic filing of tax forms really ease the complexity introduced by a selfulfilling bureaucracy? Or does it just perpetuate it? Many empowerment programs still "look suspiciously like an idea in search of a place to happen"[8].

On the other hand, a reasonable understanding of empowerment, can ease much pain. The concept itself is probably as old as humanity. Dr. W. Edwards Deming[9] may have given it scientific respectability. Another root is to be found in the concept of "Auftragstaktik"[10], an innovation in the chain of command and decision making process developed by the German military in the post von Clausewitz[11] era. This concept made Desert Storm a success[12]: the field commander had the ultimate authority as to how to get a job done. The orders spelled the what, where and when, but not the how.

What it really means: Changes are made as a group. Ownership of problems, solutions and effects lie with everyone in the group. Implications are explored across boundaries. The manager graduates to become a moderator and mentor. He is "Sator Arepo"[13], as ancient mythology has it, not anymore a wrathful god. Problems and solutions become unfocused and blurry. The question is not any more "How do I build a better mousetrap?". The question is "What is the problem that the mousetrap solves and what other means are there to address it?".

This is already happening. Japan is working that way. Ford, Xerox, GM[14], TRW[15], Florida Power & Light[16] and many more have shown that this concept can work. There is increasing awareness that participation is not only a means to spread the blame but will actually get better results.

This concept extends to politics. One might wonder, isn't democracy the ultimate embodiment of popular participation? Yes and no. Politics is also a prime example of how this process can break down. The downfall is the search of instant gratification or rather, the satisfaction thereof. Politicians are but an empty conduit, in which popular vote amplifies with emotions and rebounds without rational modification. The pursuit of private goals induces complacency and prevents proper mentoring.

The long term solution to this political shortcoming is education and empowerment of citizens. Politics is a badly used tool, thus citizens blame it for much evil. Education and participation must change this perception and improve the quality of the result.

Technology is teetering on the brink of the same chasm: push it over, and it becomes evil. Use it judiciously, and people will understand its potential and achievement. The potential for instant gratification carries the seed for disaster: if gratification ceases, the tool may be condemned.

We must go out of our way to force communication and understanding. We must take the extra moment to show that there is no more magic to a computer than to a backhoe. And, first and foremost, just "whiz bang!" doesn't do it. There are instances where TTY beats GUI, flat files beat data bases and the carrier pigeon beats T1 data lines. Let's be humble and speak up. Context is key. Understanding is paramount. Communications is leadership. Participation beats instant gratification and goes a long way towards success.

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[1] Postille a Il nome della Rosa -- Umberto Eco -- Bompiani, 1984 -- page 7: Il titolo e il senso

[2] Detroit: intersection of Congress and Randlph

[3] America Oggi -- Anno V, N. 144 - Sunday, May 24, 1992 -- page 1: "Assassinato Falcone"

[4] Information Please Almanac -- Houghton Mifflin Company, New York, 1992 -- ISBN 0-395-59671-8 -- page 55: Persons below the poverty level: in 1970: 25,420,000; in 1989: 31,534,000

[5] Wall Street Journal; June 1, 1991; Page B1 - People Patterns; Poll by the Roper Organization

[6] American Business: A Two Minute Warning -- C. Jackson Grayson, Jr. and Carla O'Dell -- Macmillan, 1988 New York -- pp.247 ff

[7] Harvard Business Review -- November/December 1991.-- page 115: A Voice of Experience by Davis Dyer

[8] Harvard Business Review -- May/June 1992 -- page 71: Corporate Redemption and the Seven Deadly Sins by Andrall E. Pearson

[9] Contemporary quality expert and management consultant who advocates designing quality into products rather than enforcing quality through inspection and controls.

[10] Triumph without Victory -- by the Staff of US News -- Times Books, New York, 1992 -- ISBN 0-8129-1948-3 -- page 292: "Taken from the German concept of Auftragstaktik, the idea was that each commander - from the corps to the division to the brigade all the way down to the squad - would be given the unit's mission, but allowed to plan it and execute it himself".

[11] Carl von Clausewitz is a Prussian military expert who in the 1820s has documented the principles of successful warfare in his book: Vom Kriege

[12] Triumph without Victory -- by the Staff of US News -- Times Books, New York, 1992 -- ISBN 0-8129-1948-3

[13] SATOR AREPO TENET OPERA ROTAS: An inscription found in Pompeji in a magic square. This expression was a lucky charm. "Sowman Arepo works hard steering the Wheel of Fate"

[14] The Man who Discovered Quality -- Andrea Gabor, Penguin Books, New York, 1992

[15] Harvard Business Review -- November/December 1991.-- page 115: A Voice of Experience by Davis Dyer

[16] Deming Management at Work-- Mary Walton, Perigee, New York, 1991 -- ISBN 0-39951685-9

Fuzzy Logic, Human Thought

Lee Hart

Have you heard of fuzzy logic? Sounds like an oxymoron, doesn't it; like military intelligence or government aid. But this technology with the funny name is actually delivering intelligent machines today, while the neural network and AI theorists are still arguing about whose job is more impossible.

Virtually every Japanese product with a microcontroller is switching to fuzzy logic. It's appearing in automobiles, appliances, VCR's, cameras, and all sorts of industrial equipment. A few of these products are beginning to show up here. Camcorders that eliminate jitter. Air conditioners that use 20% less energy. Cars with lower emissions and higher reliability.

I'd like to tell you about what fuzzy logic is, and why you should learn more about it — now! I think it is one of those rare breakthroughs that will change your life.

The logic of Aristotle has reigned supreme for 2000 years. It is considered the only way to think clearly and make good decisions. It is the logic of the rational man, the philosopher's ideal, the logic of computers, and of Mr. Spock.

Well, Spock is wrong. There is another kind of logic, far better suited to the management of human affairs. It is fuzzy logic; the logic of human thought, of the imprecise, of the approximate, the logic of the excluded middle.

Standard Aristotelian "crisp" logic assumes that everything can be classified into one of two categories; true/false, yes/no, up/down, left/right, etc. If you cannot answer a question with a yes/no answer, the problem is yours, not the logic's. Think about the question some more, or gather more information, or sort it more carefully; you will be able to deduce the answer in absolute terms.

Crisp logic works superbly for many problems. It has enabled the whole world of science, engineering, matehmatics, and computers. Define the input variables, solve the equations, and a precise unambiguous answer pops out. The cathedral stands. The radio plays. Men land on the moon.

The problems begin when people get involved. Putting men on the moon is easy compared to putting a nuclear power plant in Boston. Homo Sapiens do something that seems to be unique in the world of nature and physics; they can think (and act) non-logically. No, I don't mean illogical; their logic isn't ill, it's just not predictable by ordinary means. This is why computers haven't passed the Turing test; how can you program a computer to think like a human if you don't know how humans think?

Does this mean we are somehow different? The standard answer is that man is no different fram a monkey or a maggot; just more complex. We can't predict his behavior because we don't have enough data and equations. Perhaps we never will; since we are human ourselves, maybe we don't have the capacity to understand something as complex as ourselves.

Berkeley professor Lotfi Zadeh proposed another answer. Perhaps the human brain uses some other form of logic, different from deductive or inductive logic. This could explain why we can so easily solve problems that are exceedingly difficult for even the largest supercomputers.

Zadeh theorized that we classify information into fuzzy sets. Facts are not simply true/false; each has a range of truth values. A statement could be slightly true, usually true, mostly true, possibly true, uncertainly true, etc. Adverbs like slightly, usually, and mostly are called linguistic variables. They are non-numeric modifiers that affect our degree of belief in the statement.

Suppose we are trying to control a bedroom window. The rules are:

If it's hot, open the window.
If it's raining, close the window.

Any computer could easily solve this problem. So could any human. But suppose it is hot AND raining. The computer gets trapped in an impossible paradox by its true/false reasoning. Either opening or closing the window is wrong. TILT!

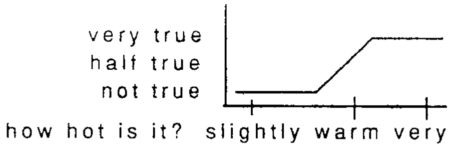
But a human has no trouble deciding to half-open the window. This will half-satisfy both rules, which is the best that can be done under the circumstances. Here is how a human would interpret the above rules:

If it gets hotter, open the window more.
If it rains harder, close the window more.

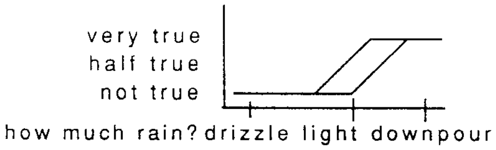
You judge how hot it is (slightly hot, very hot, etc.) to determine how far to open the window. Then based on how hard it's raining, you decide how much to close the window. Finally, you compromise between opening and closing to approximately satisfy both rules.

Zadeh's fuzzy logic works the same way. The rules in a fuzzy logic program are very much like a standard computer program (if ... then ...). But there are no loops or branches; every rule is always evaluated to produce a fuzzy set. For the above problem:

Rule 1: if hot, open window



Rule 2: if raining, close window



The graphs show the membership functions for the variables HOT and RAINING. If it's only slightly hot, rule 1 is not true. As the temperature rises, rule 1 becomes half true, and then very true when it's very hot.

Rule 2 is more interesting. At less than a drizzle, it's not true. For a downpour, rule 2 is very true. Between drizzle and downpour, rule 2 has a range of truth values; a fuzzy set. For a light rain, rule 2 could be anything from not true to half true. This reflects the fact that other factors will affect the decision; such as which way the wind is blowing.

We decide what to do by the fuzzy inference method. Instead of a math equation, we simply test each possible output (window position) and pick the one that best satisfies both rules. Let's say it's warm, and a light rain is falling.

Rule 1: half true, so half open the window
Rule 2: something between closed and half open

You can think of each rule as "recommending" a particular action. Rule 1 has a definite (crisp) opinion. Rule 2 isn't quite as sure of itself, so it has less influence. The process of deciding what to do is calle defuzzification. In this case, let's average each rule's advice, then average their result.

Rule 1: open the window halfway = 0.50
Rule 2: open the window (0 + 0.5) / 2 = 0.25
Conclusion: open the window (0.5 + 0.25) / 2 = 0.375

Oops! I used numbers. REAL fuzzy logic doesn't do numbers; it would have answered "open the window moderately". Fuzzy computers are much like analog computers; they manipulate a continuous range of values, rather than numeric data.

Here lies the rub. Numbers have been pumped into us for so long that we are hopelessly addicted. We use them to count all sorts of things that are totally inappropriate. "How do I love thee? Let me count the ways..."

When Zadeh published his fuzzy set theory in 1965, he was loudly denounced as a dangerous heretic. The word "fuzzy" touched a raw nerve. Critics claimed he was trying to destroy the entire world of mathematics in a fog of fuzzy thinking.

The offensive name did have a good side effect. His critics worked overtime trying in vain to find holes in his proofs.

Professor Zadeh says the only way he could have gotten more researchers to test his theory would have been to name it "fuzzy sex".

Fuzzy logic is not fuzzy thinking! It is a precise non-numeric discipline of mathematics. Real-world problems are not numeric. We don't solve equations in our heads to walk, fly a plane, recognize patterns, or make the thousands of decisions of daily life. If we are going to have intelligent machines, they must think in non-numeric terms, too.

A reliance on excessive precision and numerical methods is the ultimate bureaucracy. More numbers is not more data. It is an infinite descent into the Mandelbrot set, where greater precision only makes finer distinctions between nothing at all.

In what has become an old story, the US scorned fuzzy logic, while the Japanese have embraced it as a technological breakthrough. Zadeh was awarded the Japanese equivalent of the congressional medal of honor, and "fuzzy" was voted the best word of 1991 (no kidding).

Okay, so what's so great about fuzzy logic? Why should we care? Here are some examples:

1. Drastically reduced hardware (and thus cost) of a control system. I have an NLX230 fuzzy logic microcontroller, a 40-pin chip that sells for $14 each. It can balance a unicycle, a control problem that is beyond a PC clone at 100x the price.

2. Reduced program size: A bank auditing program written in COBOL took over 100,000 lines of code. Fuzzy logic took 6 lines of code to do the same thing.

3. Easy to program: NASA wrote an autopilot program for the space shuttle in one week. Fussy programs look like english, and even non-programmers can produce good results.

4. Extremely fast: JPL was doing aircraft flight simulations on a Sun workstation that ran 10,000 times slower than real-time. On a Cray, they ran 1/3 of real time. A Togai Infralogic fuzzy micro ran it 2x faster than real time.

5. Fault tolerant: If buildings were built like computers, one termite could bring down the Empire State Building. Fuzzy micros execute every instruction continuously, and vote on the result. Faults in a fuzzy program have very little effect. The system gradually degrades rather than catastrophically fails. This is vital in applications like nuclear power plants or aircraft flight computers

6. Human-like reasoning: Japan's Sendai subway has a fuzzy conductor. Its rules were to minimize the wait for a train, and minimize travel time without exceeding speed and acceleration limits. When first put in service, a 5:00 train left on-time, but with few people. A minute later, a rush of factory workers arrived in the station. The fuzzy control stopped the train, and backed it into the station. It decided to inconvenience a few passengers in order to keep many from waiting. The management had to add a rule to tell it not to back up.

7. It learns: Fuzzy logic is making the dreams of neural network and AI theorists finally come true. Adaptive fuzzy systems can modify or write their own rules. A surface-to-air missile with a fuzzy controller found it could gain a little more forward thrust by running all 4 attitude jets at once. This made it fly a kinkier path, but hit the target sooner.

8. It solves intractible problems: The classic greek paradoxes do not exist for fuzzy logic; science fiction writers will have to find a new gimmick for defeating a 21st century robot. A current example; it is very hard for a digital computer to recognize patterns (voice, handwriting, faces, fingerprints, erc.). But fuzzy notebook computers are now sold in Japan that can read Japanese handwriting.

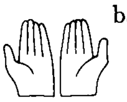
Think back to 1975. The January issue of Popular Electronics festures the "Altair 8800; a Minicomputer for only $400". Did you buy one? How long did it take you to realize that it was the start of something big?

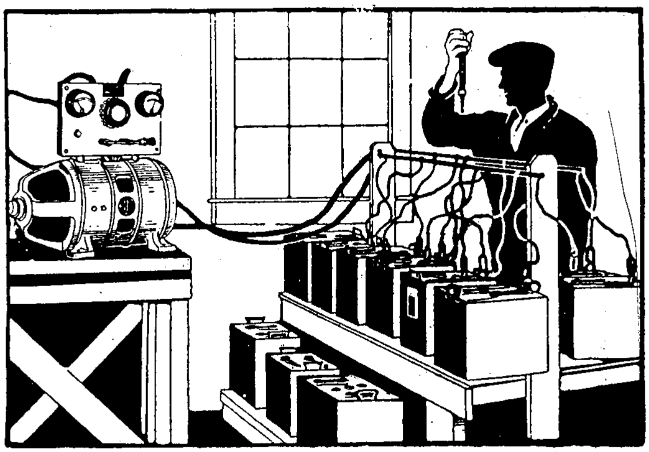
Fuzzy logic is as big a breakthrough as the invention of the microcomputer. Within 10 years, fuzzy controllers will outnumber computers. You've got a second chance to be in at the beginning. Go for it! I am!

For more information:

American Neurologix 411 Central Park Drive Sanford, FL 32771 407-322-5608	NLX230 fuzzy micro, $14 PC development system, $395
Hyperlogic Corp. 1855 East Valley Pkwy #210 Escondido, CA 92027 619-746-2765	CUBICALC fuzzy software for PC's, $495. Fuzzy logic to C translator, $795
Togai Infralogic Inc. 30 Corporate Park #107 Irvine, CA 92714 714-975-8522	FC110 fuzzy micro, $100 special fuzzy-C compilers and software tools, $1K - $5K
The Huntington Group 883 Santa Cruz Ave. #27 Menlo Park, CA 94025 415-325-7554	"Huntington Technical Brief" fuzzy newsletter, consulting
Red Rock Systems 1519 Mount Everett St. Colorado Springs, CO 80909 719-578-0997	"Journal of Fuzzy Applications" newsletter, $29/year

...and of course, your favorite engineering library!



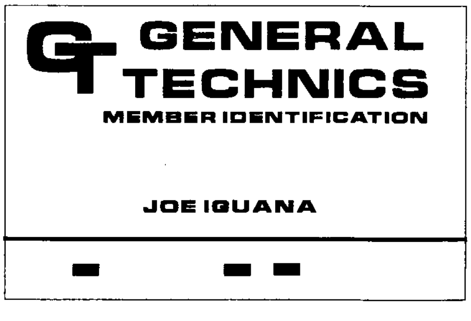


Classified

Wanted: Information on alternative electrical healing devices—violet rays, radionics, Abrams devices, electronic mind machines, electro-theraputic medical devices, electro-treat, fadric belts, Drown's devices, electric corsets/rings, magnetic combs. cure-all devices which spark, shock, buzz, or light up, spectrocrometry devices/books, radionic devices, reflexaphones, galvano machines, and orgone boxes. Want books or devices. Also interested in old TVs made before 1950 and odd electrical devices.

Steve Chekey, P.O. Box 39, Litchfield, OH 44253

For Sale: Aerotech PS2 2mW laser power supply with keyswitch, indicator light, remote capable; needs Alden connector: $100. JCPenney 19" color TV, not remote capable, no color channel 3: $75. Akai 4000DS MkII 7" RTR 4-track 2-channel tape deck, excellent condition—w/tapes: $125. Chinon XL555 super-8 movie camera w/macro, 2-speed power zoom 8-40mm f/1.2, slow/fast/single-frame w/time-lapse, more: $75. GAF Dual-8mm autoload movie projector, good condition: $25. Mansfield standard-8mm reviewer: $20. Prices negotiable. Call Nick at (708) 790-3435.



GT GENERAL TECHNICS

MEMBER IDENTIFICATION

JOE IGUANA

(ACTUAL BADGES ARE A NEGATIVE OF WHAT YOU SEE PICTURED)

GT Namebadges Are Back!

Mary Lynn S. Johnson

They're back. After about ten years, it is now possible to once again order genuine General Technics namebadges.

Originally, Bob Halloran was producing them but stopped doing so just about the time I wanted to get one. Ever since then, I've kept an eye out for a way to produce the badges in the very same manner that Bob had. To my great delight, Ted Hueckstaedt turned out to be our answer. Ted is an offset pressman who is not only a member of GT but has been donating huge amounts of time and discounts in the offset printing of *Pyro*. He has promised to pull out the stops for issue #50 when we finally get it all together. After finding out that Ted would be glad to help us put together new badges, I found that I had no idea what code Bob Halloran had been using on the bottom of the badges. Bob later told me that the coding he used was somewhat casual. At that point, I decided to try to make a coding that would be universal and would withstand the test of time and still look similar to the original.

After about four hours of poring over all back issues of *Pyro*, I generated a list of numbers based on the old Mob lists. Starting with the first list, I numbered everyone on it while in alphabetical order. (Yes, Jeff Duntemann *is* number one...). Then I deleted all those people from the next Mob list and continued numbering the remaining folks. And so on and so on I went through all the mailing lists up to the present. Now I add people to the list as they sign up. This means that everyone who has ever signed up for *Pyro* has a number that could be translated into a binary number. That number would then appear on the bottom of the new badges.

I was also confronted with the problem of spouses who don't have a separate subscription to *Pyro*, but would like to have a badge. I solved it this way: If your spouse wants a badge but you have one subscription between you, then your spouse's badge will have their own name but share the subscriber's number. If the spouse wants his or her own number, then they need only subscribe independently to *Pyro* once. Then they will have their own number forever. Carol Duntemann and Jo Gehm are examples. To do it any other way would complicate the method derived from the old Mob lists beyond usefulness.

Ted set up a file so he can generate the badges all in his computer and then print out a master sheet of about 6 to 8 badges per sheet. That master is then shot on a stat camera onto a huge sheet of Kodalith. The badges are then cut up, overlaid on silver diffraction grating and then encased in a plastic badge holder. The resulting badge is virtually identical to the ones produced so long ago, except that the coding will be different. They've been real attention-getters at the last two cons we've handed them out at.

Membership in GT: Active and Inactive

This is significant for more reasons than just individuality. We have devised the first new criterion for being listed as an active member of General Technics. It's pretty simple really. If you have written anything for *Pyro* in the last 4 issues, OR hosted a Berserker weekend, OR contributed time and or effort towards the assembly or management of GT or *Pyro* in the period of time covered by the last 4 issues,...your membership is considered "Active." If you just subscribe to *Pyro* but don't contribute material or effort, your membership is listed as "Inactive." What significance does this all have, you may ask? Well, not much when it comes to having a namebadge. Anyone with a current subscription to *Pyro* can order one. But when we offer t-shirts (I'm hoping for two different designs) and buttons and bumper stickers at next year's Berserker, being an active member will get you significant discounts on the prices of those items. Also, I might be doing items like ceramic mugs that will be available only to those with an active membership.

Jeff Duntemann initally wanted GT to be viewed as a wealth of information that creative people could tap for answers. This criterion for membership will hopefully feed the fires a little bit with a few perks for those who go the extra mile for GT and *Pyro*. I have some ideas for resurrecting the GT handbook, but I'm going to wait for those to gel a little bit more first.

For those of you who haven't seen a GT badge, a small one (for our first non-mammal member) appears at the top of this article.

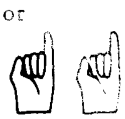
How to Get a Badge

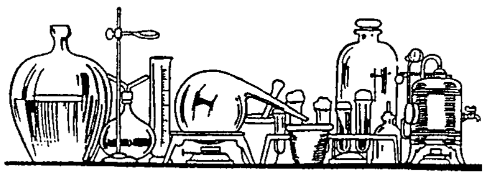
Now, to get your very own personalized GT namebadge, follow these instructions carefully:

- Send me a request for a namebadge SPECIFYING how your name is to appear on the badge. Real names only. If you want a pseudonym or some such on your badge, your reason has to be a really good one. Be careful how you spell it too. If you misspell it in your letter, and we do the badge that way, you'll have to pay full price again for a corrected badge. Our mistakes we correct for free.
- Send me a check made out to "Mary Lynn Johnson" and write "GT Badge" in the notes field. The cost for one badge plus postage is $3.50. I will NOT be responsible for any cash sent or lost by mail, PERIOD.
- Allow 4 to 6 weeks for your badge to be sent to you. We do them in sheets of at least 4, so we might try to get a few together before running them.
- If you want to know if your membership is active or inactive, send me a self-addressed, stamped postcard and I'll send it right back with your number and code on it as well as your status.
- The address to sent badge orders to is as follows:

PyroTechnics
GT Badge
PO Box 965
Aurora IL 60507

NOTE: No matter what the temptation may be to send orders to my home address, DON'T. It will delay your badge order by several weeks.





THE FORERUNNER AIRCRAFT

by Rodford E. Smith

Part Two: The Planes

First, an apology. I am neither an artist nor a drafts-man, so the drawings which appear with this article are somewhat rough. I think you will agree, though, that the aircraft they represent would be beautiful.

The goal of the Forerunner project is to provide a safe, high-performance homebuilt plane with an endurance at cruise of at least 20 minutes, using available technology. Below are descriptions of the development of the Forerunner II and III. What, you might ask, became of the Forerunner I? I saw early in the design process that this first attempt would not be stable much above Mach 1. I therefore abandoned it. Strangely, in a NASA paper on the feasibility of a Mach 5 bomber, which I read later, the simplified airframe used in their evaluation was almost identical in shape to the Forerunner I!

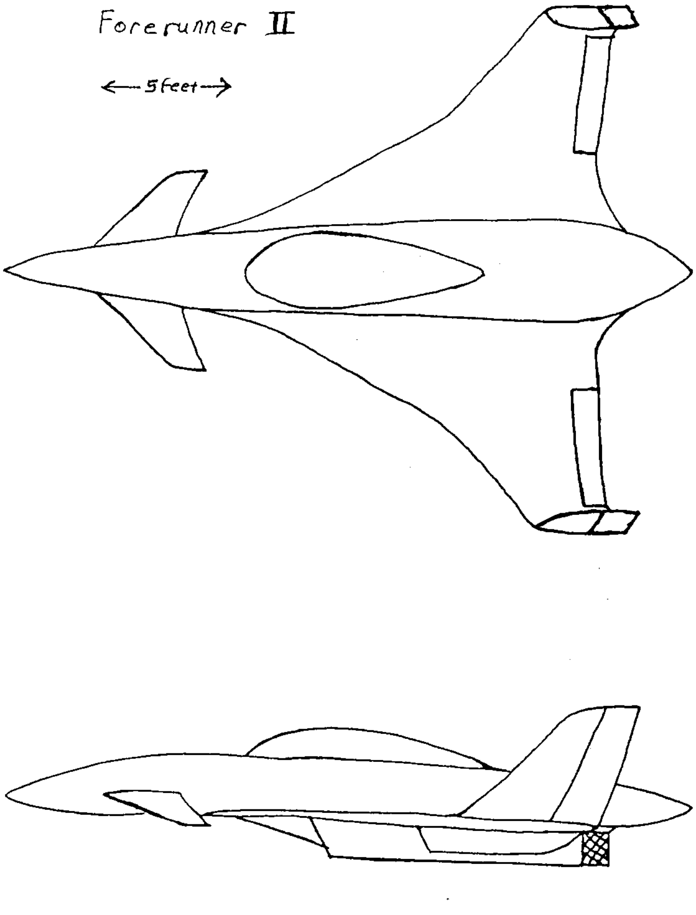


Figure 1

Forerunner II

This small craft (Figure 1) is intended to sell for under $250,000. It will come in kit form, with all components needed to build a flyable plane. The top speed will be Mach 3.5, with a cruise of Mach 3.2. Endurance will be around 20 minutes at cruise speed. Careful attention was paid to area rule and streamlining.

The seat is reclined, both to ease the g loads on the pilot and to reduce the height of the fuselage. The fuel is ordinary JP, as mentioned in the Part 1 of this article.

This is the base model of the Forerunner II, but there is plenty of room for improvement. The estimated top speed of operation for an airturboramjet engine is about Mach 6. This plane would only be able to achieve a little over half that. How, then, to make better use of the engine's potential? The main problem in flying faster is heat from air friction. At speeds above Mach 3.5 the temperature at the hottest locations on the plane - the nose and the leading edges of the wings and fins - will be high enough to weaken the bonding agent, causing the composite to delaminate. The aircraft would literally come apart in the air. Going to a higher altitude only helps to a point. Above about 100,000 feet the increase in benefits with increasing altitude declines rapidly, so that you would have to rise above 150,000 feet for any real change, and maybe as high as 200,000. It is more practical to add foamed ceramic overlays to the nose and leading edges to increase the top speed. There are three benefits to this: First, the ceramic is a very high temperature material. Second, it is a good insulator, reducing the transfer of heat to the rest of the plane. Third, and this will require some explanation, the blunt surface of these added pieces would create a stagnation layer.

Look at winged re-entry vehicles, such as the X-24 and the Space Shuttle Orbiter. The nose and leading edges are very blunt, just the opposite of what you would expect for high speed flight. What happens is that this blunt surface traps a layer of air, which prevents direct contact with the slipstream, reducing heat transfer. In the thin air at altitudes where hypersonic flight takes place, the added drag from these blunt surfaces is minimal.

Okay, that, plus larger control surfaces, will get us up to Mach 4 or even Mach 4.5. Which is about the limit for conventional jet fuel, anyway. Not bad. We have a basic, bare bones aircraft which will reach Mach 3.5 and a deluxe version which might go as fast as Mach 4.5. Still, there is that extra margin of performance in the engine...

Forerunner III

The Forerunner II gave me a homebuilt which could fly formation with an SR-71, but to fully realize the potential of the ATR would require a new design. The estimated cost is just about double that of the previous plane, to somewhere under $500,000. There are enough people who will pay this - and more - for a sports car which will only do 200 mph to keep several production lines running, so cost shouldn't be too much of a problem in creating a marketable aircraft.

I made the Forerunner III longer, gave it a somewhat larger wingspan, and made the control surfaces even larger in proportion (Figure 2). The added control authority this longer moment arm provides allows the Forerunner III to fly safely at higher altitudes, perhaps as high as 250,000 feet. This means less heat, so the cruise and top speeds are higher, around Mach 5 and Mach 6, respectively.

The two best choices for fuel are liquid hydrogen and liquified natural gas (LNG), which is mostly methane. Liquid hydrogen is expensive, hard to store and requires special materials in the fuel tanks and delivery systems. LNG has a higher storage temperature, has been in industrial use for decades, and has a much higher energy density, so you need smaller tanks on the plane. Given the small size of the Forerunner III, this fuel compactness is important. Besides, you don't need hydrogen's super-fast burning properties until you start using scramjets.

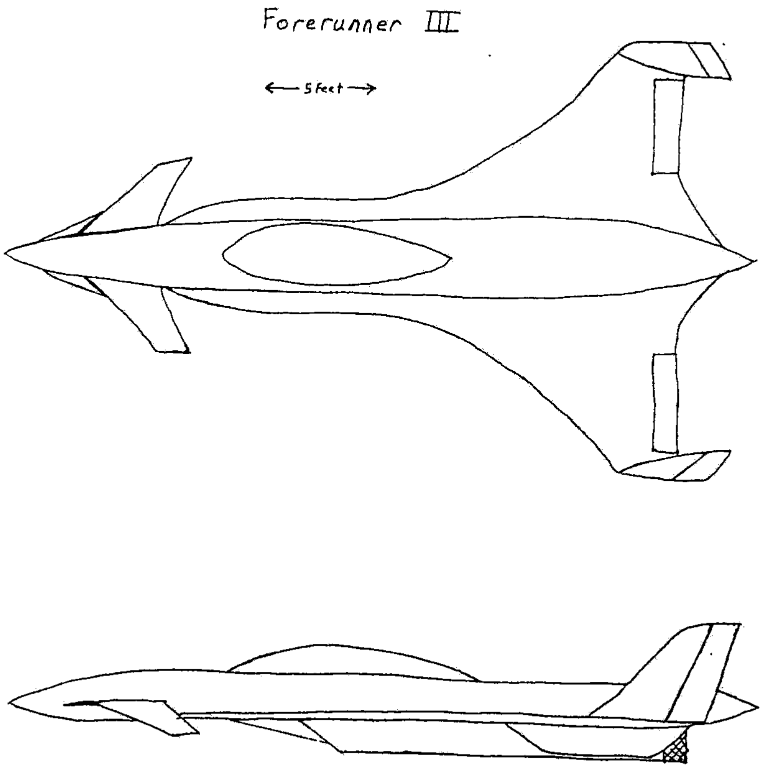


Figure 2

Unfortunately, LNG contains carbon and nitrogen, both of which form combustion products that are harmful to the ozone layer. I chose methane anyway, but worried about the pollution this might cause. As it turned out, serendipity struck again, as outlined below.

Okay, I now had a plane that could reach Mach 6, which is as fast as the basic ATR can go. It could fly formation with an Aurora, and possible even go faster. I was happy. Then I read a brief about some computer simulations run by a Japanese researcher. If he is right, you can raise the top speed of an ATR to Mach 8, simply by adding a cooling cycle at the inlet. The challenge was on again.

There are several ways to cool the air coming into an engine. I could have used regenerative cooling, the method NASA is planning for the NASP. That involves running the fuel through tubes around the inside of the inlet and ramp, then passing it to the engine. However, my intent was still to keep things as economical and simple as possible, and the simplest method of cooling the air was water injection. A ring of misting nozzles around the inlet and along the leading edge of the ramp would do the job. As an added benefit, this would also add mass to the flow, increasing both thrust and efficiency. Not bad. The engine could now do Mach 8. But how could I keep the plane cool at this higher speed?

As I pondered this, I recalled something else, and serendipity yet again reared its pretty head. Back in the early seventies, experiments were performed on using transpiration cooling to protect ballistic missile warheads during reentry. Water was ejected through a porous ceramic cap on the nose; as the water evaporated, it carried the heat away, at the same time forming a protective film which performed much the same function as the stagnation layer. I already had foamed ceramic on the hot spots. I already had water injection for the engine. All I had to do was provide a larger tank of water, some extra plumbing and a bigger pump, and I was in business.

Now I had something! This gave me an engine possibly capable of Mach 8 and an airframe theoretically capable of surviving re-entry! Moreover, the engine exhaust would be surrounded by a sheath of water vapor, streaming back from the cooling system. This would combine with the combustion products, either taking them into solution or causing simple physical capture, in both cases creating large molecules which would settle quickly into the lower atmosphere. There went my main objection to LNG!

So, want to go for a quick ride to the Bahamas?

Optional Extras

Both aircraft would have available a number of options for additional cost. The B model of each would have two seats, the second included in a stretch section which could be built in from the start, or added to the A model later. Bolt-on conformal tanks over the wings would extend the range, at a slight penalty in performance. A supercruise engine would use regenerative heating of the fuel to reduce the amount of bottled oxygen needed for flight below Mach 2, which requires a bit of explanation.

As mentioned above, the regenerative cycle passes fuel around hot spots in the engine (and possibly the airframe), then on to the power turbine. Since the expansion of the vaporized fuel could drive the power turbine without combustion, less onboard oxygen is needed. This would allow improved subsonic and low supersonic cruise economy. The supercruise engine would also have bypass doors for full ramjet operation, which would reduce wear on the compressor blades and turbine at high speeds.

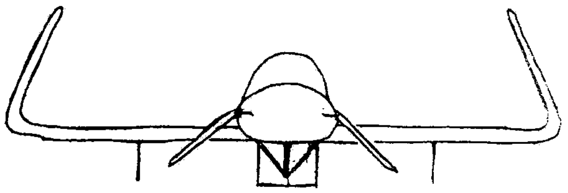


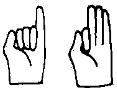
Figure 3
Typical Front View

Wild Stuff

Okay, lets get a bit crazy with technology, here. The Forerunner III is theoretically capable of surviving re-entry. So, as a promotional stunt, we strap on some solid rocket motors and do a suborbital hop from Baja, California to Hawaii. (The unofficial land speed record was set a few years ago by adding a Sidewinder solid rocket motor to the Blue Flame rocket car, so there is precedent.) The trip would take about thirty minutes, not counting landing.

Okay, you say, playing devil's advocate. You can get enough thrust to make the hop, and the plane will survive re-entry with some modifications - but only if you are lined up nose first! What do you use for attitude control? Simple. A parachute.

A small ceramic fiber cloth parachute on a long tether would provide enough force to keep the nose pointed in the direction of travel. It would be deployed near the top of the trajectory, where the extremely thin air would just be enough to inflate it and swing the plane's nose around. Once the spaceplane was deep enough into the atmosphere for the control surfaces to work, the chute could be jettisoned.



A scramjet module under each main wing could raise the top speed of the Forerunner III to above Mach 20. You would need to burn hydrogen, though, and that reduces the range drastically. This probably isn't practical in such a small plane, but see below for another application.

NASA has recently developed an engine which combines the functions of the ramjet and scramjet, and does this without internal changes of configuration! They just change the location of fuel injection depending on the flight conditions. This ramscram could make the NASP practical.

One modification of the ATR transforms it into an ATR-R, or airturboramjet-rocket. This give you one engine with the capability to take you from runway to orbit. The configuration is much more complicated and expensive than a standard ATR but the data provided by flights of the Forerunner II and III will allow easier development.

If the ATR can't be used - for reasons of expense or technical difficulty - either design could make it to Mach 2.5 on a standard high-performance turbojet. That is fast enough for a ramjet to function. And we know that ramjets work.

Commercial Applications

One reason for going the homebuilt route is that you can avoid the hassles of FAA certification. Can you imagine what would happen to a request to certify a plane that can make Mach 8? The company would be lucky to get a reply! After Forerunner planes have been flying for a while, and the data obtained from them studied and used to make refinements and improvements, we can apply the basic technology to other areas.

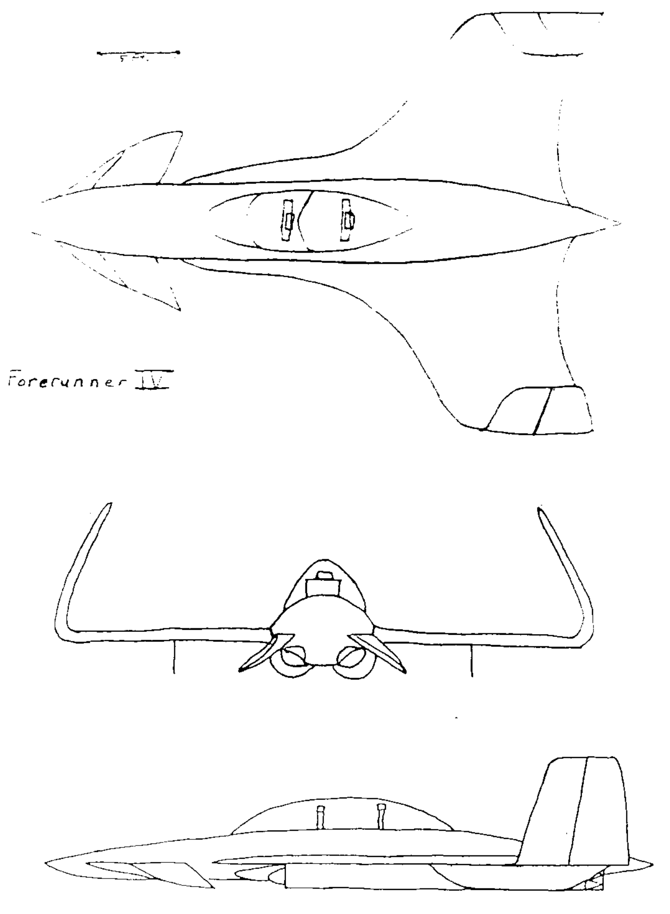
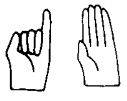


Figure 4



The Forerunner IV is a proposed Mach 6 reconnaissance plane. It would have about the same performance as the fabled and officially nonexistent Aurora, but with a shorter range and a much smaller payload. It would also cost much less, perhaps as little as a million dollars per item (omitting the money needed for the dedicated military and surveillance equipment).

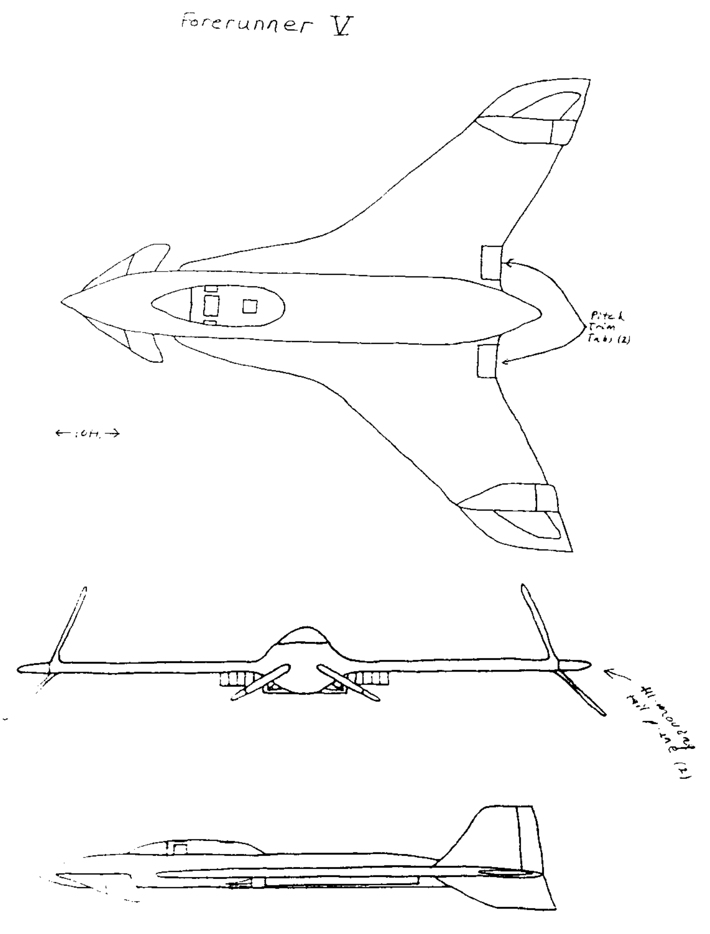
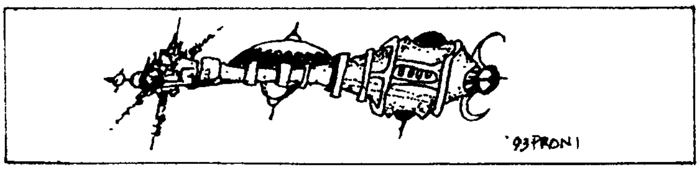


Figure 5

The Forerunner V would be a four-place business jet. The pilot and three passengers could be anywhere in the world in an hour or less. Scramjet modules under the wing would allow a cruise speed of Mach 15. If hydrogen is carried for short dashes, it might reach Mach 20! Cost would be under $5 million - less than many conventional business jets. But then, it only carries four people!

And there you have a brief overview of the Forerunner concept. The technology is there; if the applications are practical and if we can keep the safety nazis, the NIH factor and the bureaucratic ostriches out of the picture, there is great potential not only for fun, but for the development of a technology base which could result in an economical *civil* aerospaceplane. A Model A - or perhaps a Wright Flyer - for the 21st Century. Spread the word.



Thimbleberries: Something about them and how to grow your own

Mary Lynn Skirvin Johnson

Those of you have been to the Upper Peninsula of Michigan have experienced the wonderful expanses of forests as well as the beautiful shoreline of Lake Superior. But there is a smaller treasure that you might not notice right away tucked in at the edges of shadowed forests or along the sides of rural roads. Discovered in 1810 by the naturalist Thomas Nutall on Mackinac Island, Michigan, thimbleberries can be found throughout most of the northern regions of the United States. Though there is more than one variety of thimbleberry, I will be talking about the one known as *Rubus* ('bramble') *Parviflorus* ('small-flowered'), or Wild Thimbleberry.

thimbleberry

Thimbleberry plants are first noticeable by their large, maple-like leaves. The leaves are from 2 to 7 inches across, have 5 major lobes and serrated edges. They have distinct veining and the surface of the leaves are slightly fuzzy to the touch. Deep green in color, the plants are offset in the months of April through July by fine white flowers about an inch or so across, clustered in loose, open groups at the tops of the plant. They are tall plants, reaching heights up to 6 feet tall, though in forests, they tend to stay around 3 feet.

Despite being closely related to the blackberry, thimbleberry plants do not have thorns. Their stalks are slender and unarmed. Young plants have green stems while older ones develop a grayish bark that tends to flake and peel.

In July and August, hemispherical, velvety fruits replace the flowers. The fruit is dark red and separates easily from its receptacle. Though many sources I consulted dismissed the flavor as unremarkable (or in one case, considered it inedible!), I agree with Mary and Steven Thompson, who stated in their book, *Huckleberry Country: Wild Food Plants of the Pacific Northwest,* that the "...flavor and juiciness of the berries vary considerably from place to place, and the really good ones are exquisite." They go on to state that Indians also pressed the fruits into dried cakes or ate the peeled young stems as a vegetable.

One of the great treats of going up to the Upper Peninsula for the big Berserkers is coming back with a few jars of homemade Thimbleberry jam. I've been able to taste-compare two samples of such jam and my opinions of them follow:

Poorcock Abbey Wild Thimbleberry Jam prepared by the monks of the Society of Saint John, Eagle Harbor, Michigan. Price in excess of $6.00 plus tax per pint.

This sample contains more additives than traditional recipes for making the jam call for. (See end of article for recipes.) Listed on the lable are "Fruit (or fruit juice); sugar; and fruit pectin. May also contain: Lemon juice; spices." The flavor is quite sweet, though the original thimbleberry flavor almost gets lost. The texture consists of fruit pulp and soft seeds.

Northern Pride Pure Thimbleberry Jam prepared by James Moehrke, Lake Linden, Michigan. Price was $4.89 plus tax per pint.

This sample was virtually identical to the Poorcock Abbey sample in look and texture. The most noticeable difference was in flavor. Northern Pride has less sugar and is therefore truer to the real flavor of Thimbleberries. I found this one to be especially wonderful as a topping for ice cream or spooned onto low-salt or salt-free crackers.

Since I enjoy thimbleberry jam so much, I have undertaken to grow the plants here in Illinois. Rather than detail all the fits and starts I had, I will simply outline what I learned.

Plants are available from two sources. You can dig them up in the wild or you can buy them from Forest Farm Nursery in Williams, Oregon. The wild thimbleberry plants can be found along most of the roadsides in Upper Michigan, but 2 out of three plants I have encountered have wasp galls on the stems. (Wasp galls are nests of wasp larvae laid inside the stem of the plants causing a huge nodule.) These galls, while sometimes dried and used for dried flower arrangements, are very damaging and weaken the plant to such a degree that they are unable to produce flowers or fruit. When digging up wild plants, select specimens that have either no galls or a gall placed where you can cut it off without removing too many leaves. With plants that are about one foot in height, dig a root ball about a foot across. Shake off the loose dirt and sprinkle the roots with "RooTone" or similar brand rooting hormone to encourage formation of roots. Thimbleberries are "suckering" plants that propagate by sending tendrils out underground and then leafing out above ground without putting down roots at that location. When digging up a plant, chances are that you will be severing its pipeline to the roots so it will need to be helped to make its own root system. Place the plant gently in a depression (also dusted with hormone) made in a container filled with wet sand. Gently push the sand up around the plant to support it. Thimbleberries shock easily so don't be surprised if the leaves all fall off and the naked stem looks dead within the first week of getting it home. Be patient. Keep the sand moist and the container cool (not cold) and in the shade. Mine took about 3 to 4 weeks to start budding out again and they are now fully leafed out , looking much better than they did in the wild. They are pretty hardy plants and will come back if you're willing to wait for them.

They can also be purchased in ready-to-plant 2" x 2" x 6" biodegradeable containers. Forest Farm's most recent catalog lists them at $4.95 per container plus shipping costs. I've had one of these for nearly a year now and it's doing very well. It's gotten much too big to keep in the house. If you wish to recieve a copy of their catalog, I have included their address and phone number in the reference list.

One tip that is important to the continued health of these plants is that they are very fond of acidic soil. Illinois is on a giant limestone lake bed so our soil is very alkaline. To correct this, use Stern's Miracid (available where most plant fertilizers can be bought) both to pretreat the soil before planting well-estabished plants or to correct the leaf-yellowing that alkaline soil causes.

I really look forward to next year when my wild and tame thimbleberries have a chance to bloom and fruit. That first berry picked here is going to be a real treat!

What follows are two jam recipes:

Thimbleberry Jam

2 C Thimbleberries
2 C Sugar

Pick over berries, do not wash. Mix with sugar, bring to a boil. Boil for 2 minutes. Pour into sterilized jars and seal at once.

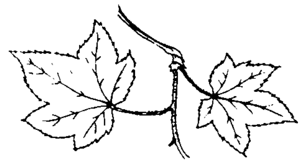
Thimbleberry Jam II

2 quarts Thimbleberries
7 C sugar
1 box of Sure-Jell

Crush thoroughly, one layer at a time, fully ripe berries. Sieve part of the pulp to remove some of the seeds, if desired. Mix Sure-Jell with fruit in saucepan. Place over high heat and stir until mixture comes to a hard boil; boil hard one minute, stirring constantly. Remove from heat; skim off foam with metal spoon. Ladle into hot jars leaving $\frac{1}{8}$ inch at top. Cover with lids and process in boiling water 5 minutes.

Yields $8\frac{3}{4}$ cups.

References:



Forest Farm
990 Tetherow Road
Williams, Oregon 97544
1-503-846-7269
Between 9am and 3pm Pacific time.

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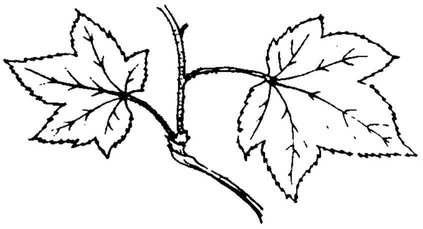


When Low-Tech Rules the Skies Franz C. Zrilich

Comments on the "Forerunner"

I have issue 49, and was interested by Rodford E. Smith's discussion of the Forerunner aircraft, a concept for a home-built supersonic aircraft. Interestingly, I have been working for several years along parallel lines, though not in the home-built market using high-technology materials and products.

However, before I go further, a few comments about Smith's concepts to any GT member thinking of building a homebrew supersonic plane: Obviously, have your specific design and actual construction checked by real aeronautical engineers, structural specialists, and power experts at each step of your work. Keep detailed records of each bit of work, step by step. In fact, I would suggest narrated videotapes and/or Polaroid photographs for each step of your work. Make certain that every single item that you use can easily take the forces, vibration, and temperatures involved– as well as extreme thermal shocks. For example, you will need Teflon-insulated nickel-clad wires jacketed in fiberglass ane possibly embedded in stainless steel flexible conduit to carry power and signals to and from your engine(s). If you don't have experience building aerospace products, I strongly urge that you team up with several workers from the field. Be sure to over-document everything that you do. It will save immense grief later on, when someone askes if the tape you used to bind together several high-temperature conduits can withstand severe vibration and temperature stresses in the −50°F to 1000°F range. Will the tape outgas something that might be corrosive at 900°F? Your records will protect your work to date.

One other point: The Soviet MiG-25 Foxbat that Smith mentioned was built in the mid-1960s to intercept our canceled B-70 Valkyrie. To save scarce titanium and skilled workers, the Foxbat was designed to be built of steel and to be powered by a very primitive engine. The literature indicates that a large cruise missile engine with a short lifespan was used to boost a ramjet to the proper speed at which the ramjet took over operation. There were two of these turbo-assisted ramjet engines per Foxbat. Boost oxygen was provided by a separate fuel reserve of alcohol. The engines were notorious fuel hogs, and had to be frequently replaced. Nonetheless, because the engines were of extremely simple design and used non-strategic materials, this was accepted. The range of the Foxbat was quite short, and to be effective, large numbers were deployed throughout the Soviet Union to provide overlapping interception. Later versions of the Foxbats had improved engines and somewhat more advanced materials and methods of construction. The Foxbat is still in the CIS inventory, and assembly and manufacturing lines have been set up in Pakistan, India, and several Mideast states.

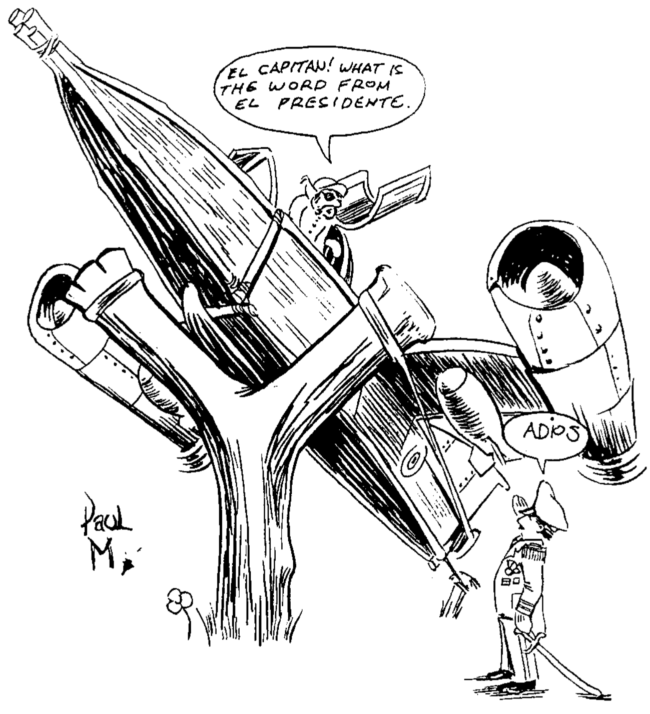
Franz's Peruvian Technothriller

My parallel line of inquiry was sort of halfway between Smith's idea of one-off homebuilts and the simplicity of the Foxbat, which was mass-produced. Specifically, I was enthralled by a series of last-ditch Nazi designs for extremely low-technology/high-performance aircraft. In general, these craft, which were too late in World War II to go into use, had all-wood bodies made of laminated plywood, sheet-metal subsonic intermittent ramjet engines (buzz-bomb motors), fall-away takeoff dollies, and pop-out landing skids. The Nazis had observed that planes usually lasted less than ten missions in combat. They designed their craft to be built by semi-skilled labor, and to have a short combat lifespan with minimal need for skilled airfield specialists. When shot-up, craft were shoved to the edge of a field and not rebuilt. The Nazis had intended to mass-produce both interceptors and attack aircraft using this technology and design philosophy.

The question that I had came from a story idea for a science fiction novel about a Pol Pot-style regime taking over in Peru, which is distinctly possible, given the inroads of the Shining Path guerillas. To threaten the rest of Latin America, then the United States, and eventually the rest of the world (the Shining Path has allies in the Assembly of Asian Republics and the Federation of Africa; together they are called "The Panists" for their Pan Africa-Asia America Pact of 1997) I decided to give the Panists a predisposition to building up heavy air forces using easy-to-build-and-maintain aircraft. The craft would be mass-produced by semi-skilled labor and would have minimal technical support in the field. While transport craft would make up the bulk of the Pan Air Force, I was particularly interested in combat craft.

Designing Two Bombers

Given that Peru has no aircraft technology base to build upon, nor even a domestic supply of aircraft-grade materials—such as titanium, aluminum, stainless steel, and so on, I decided to use what probably would be available in Peru or easily smuggled. Design and production, as well as field maintenance and flight operations, would be heavily constrained by the lack of skilled personnel.


EL CAPITAN! WHAT IS THE WORD FROM EL PRESIDENTE.
ADIOS
Paul M.

Two baseline craft emerged. The first was a plywood subsonic aircraft propelled by sheet-metal buzz-bomb engines. Essentially the size of a B-29, the craft could be built in large huts and in barns, much as the all-wood British Mosquito was built in village garages in WWII. Wood is plentiful in Peru, of course, and adhesives readily available world-wide and easy to smuggle. I have worked with wood in both batch and mass-production systems, and can easily convert engineering drawings into simple wooden jigs for the production of products with accuracies—if needed—to within half a millimeter. Presumably, the leadership of the Shining Path guerillas can obtain blueprints of advanced versions of the B-29. Presumably, the leadership can put together a design staff with a few computers to calculated how much wood to put into each element of the design. Presumably, the leadership can find lathes to peel off veneer from trees, and the manpower to make the planes.

Aircraft are usually made in two major assemblies of systems: the airframe and the propulsion system. In the case of the wooden subsonic aircraft, extraordinarily sloppy tolerances can be used to cut, bend, and fasten lightweight gauge steel into pulse jet engines that are quite powerful and can propel a craft to subsonic speeds. Any high-school metal shop can build such an engine in a few hours. There exist improved designs built since WWII for propelling drones and early versions of cruise missiles that do not have a single moving part. Assuming a five-ten mission lifespan, a minimum of support systems (such as avionics), the use of drop-off take-off dollies, and either belly landings or pop-out landing skids, costs per mission could be kept extremely low. Such a craft would function as a stealth attack bomber in Latin America, where air defense is almost non-existent, and the few radar systems available probably incapable of picking up a wooden craft.

The same plane, with modifications, could be used as a tanker for the second design of aircraft. Made of welded-up sheet steel, carrying two ramjet engines (no moving parts), and launched, as the subsonic craft would be, by either rocket-assist take-off or carrier-style catapult, the second model would be a delta-wing Valkyrie-sized supersonic bomber and/or long-range naval interceptor. It would be a fuel hog and would frequently have to slow down to subsonic flight to refuel from a tanker. Nonetheless, like the subsonic bomber, it would have a ten-ton payload. This could be 40 primitive smart bombs, 20 short-ranged air-to-surface missiles, or 10 air-to-air missiles.

Issues of Strategy

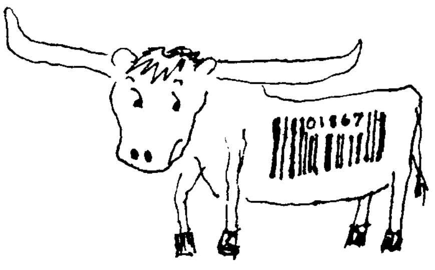
Extrapolating from Nazi and Soviet experiences, as well as our WWII production schedules, it should be easy for a Greater Peru with a population base of some 50 million, as well as several hundred light factories, and access to the then recently opened Colombian oilfields, to keep a constant force of 500 such supersonic bombers and 2000 subsonic bombers in the air. The subsonics would have the range to extend Shining Path ideology throughout most of Latin America, and could easily threaten the fragile and aging Panama Canal locks and defenses. More importantly, they could keep our navy at an extreme distance from South America. Our carriers and cruisers would be at the extreme length of their reaches. While submarines currently seem invulnerable to air interdiction, there has been rumbling in various publications that advanced neutron detectors can easily see submarine nuclear reactors under several hundred feet of water. If this is true, and if an air force such as I describe were to have access to such as system, it would render Latin America a very hard bastion to penetrate. The supersonic bombers could be used to threaten not only our navy, but many of our southern cities as well.

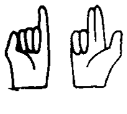
As Smith points out in his article, in the past few decades the emphasis in U.S. combat aircraft design has been not on speed, but on other factors. (Far easier maintenance, fuel economy, minimal radar, thermal, and visual signatures, amazingly high agility, and astonishingly complex automated weapons systems.) The Soviets have done the same. Consequently, it might be difficult for us to shoot down very high-speed aircraft penetrating our air defenses from the south—particularly given that we don't have a comprehensive air-attack radar warning system for the southern United States.

In the past, both Soviet and American bomber designs have included large crew sizes. While the current B-1 and B-2 bombers have four members each, there have been 15-member bombers, as well as command-and-control craft with upwards of 40 members. Usually, our missions have not exceeded 24 hours in length. However, we have experimented with week-long and two-week-long missions using split crews and constant refueling in mid-air. It is conceivable that a very large supersonic bomber could be built using non-strategic materials, employing semi-skilled labor, and be manned for two-week-long missions by large crews. Large crews means each member would have but one or two specialties, and not need to be overly trained in seven or eight specialties. Such aircraft could fly all over the world and be in constant orbit near a target nation out over the ocean. The use of large crews and some simple PC and software work would allow the Pan Air Force to mimic/match our complex systems by substituting crew numbers for machine quality.

Conclusion

While all of the above seems astonishing, bear in mind that when Germany started WWII, most of her combat craft were either biplanes or at best had fixed landing gear. By the end of the war the Nazis had flown both high-speed jets and rocket planes, and were working on supersonic flying-wing stealth bombers—something we have yet to duplicate. Presumably, if driven by the same degree of fanaticism, Peru should find the going easier.





ROGUE'S GALLERY

GTer CW Roberts shows his physics class how to toast marshmallows with an induction coil.

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